

METHODOLOGIES



Bone augmentation using autogenous block grafts and particulate bovine bone in the severe atrophic ridges: Case reviews

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Abstract

Implant surgeon should take advantage of advances in instrumentation and grafting biomaterials to augment the deficient ridges. Biotechnology has greatly improved our ability to predict and reconstruct osseous defects. In addition to present specific bone grafting techniques used to restore hard tissue volume defects at the sites, the volume of augmentation defines the procedure. Significant amounts of autogenous bone can be procured from symphysis or ramus region of the mandible. The cortical grafts of this area provide predictable increase in bone volume with a short healing time and yield a highly dense osseous architecture for implant placement. This review discusses the use of autogenous block grafts and bovine bone allograft for predictable bone augmentation in atrophic ridges.

Keywords: Allograft, autogenous graft, bone grafting, dental implants, guided bone regeneration

Introduction

Oral rehabilitation of patients with missing teeth with oral implants has become a successful treatment for last few years. Often patients present with ridge atrophy which may become an obstacle for correct implant placement. Insufficient bone volume requires hard tissue reconstruction, autogenous block bone from oral cavity has been a gold standard which has over the years has been greatly simplified both for the surgeon and for the patient. The author routinely harvests autogenous bone grafts from the retromolar, buccal shelf, and symphyseal region of the mandible, and further, it is mixed with bovine bone mineral (cerabone, botiss) to expand the volume. This bone graft is porous, hydrophilic and osteoconductive, when mixed with autogenous bone, it not only expands graft volume but also improve the working properties of the particulate graft. Corticocancellous block grafts harvested from intraoral sites offer tremendous advantages as they are biologically superior since the viable cancellous marrow cells transferred with the marrow graft contribute to the phase one bone regeneration at the recipient site. The cases discussed here are of horizontal ridge augmentation with bone blocks from intraoral sites coupled with bovine bone particulate covered with biodegradable collagen barrier (Ossix). Clinical and

radiographic evaluation further confirms the predictability of the technique.

Technique Description

Upon completion of diagnosis and prognosis (health history, extra- and intra-oral examination, radiographic analysis) a detailed explanation of the identified oral pathologies was given to each patient. As part of the overall treatment plan for all the patients, it was suggested to first proceed with a guided bone regeneration (GBR) procedure and subsequently place the implant/s. All the participants signed a specific and detailed informed consent. Under local anesthesia a full thickness flap is elevated both on the buccal and lingual sides of the mandible. After proper mobilization of the flap through periosteal vertical releasing incisions, the autogenous corticocancellous graft is collected in the surgical area either through the peizosurgery, trepanation and oscillating saw. A bovine bone, such as cerabone (botiss materials), is utilized to fill the voids. The particulate bone is gently adapted to the atrophic side of the ridge, and a properly trimmed and rehydrated Type I bovine collagen membrane is carefully adapted over the graft (Ossix, Colbar R&D Ltd., Ramat Hasharon, Israel). The barrier is stabilized in place with an initial resorbable horizontal internal mattress

suture or a series of sutures for large defects. Primary closure over the regeneration area is achieved with a mixture of the internal mattress and single interrupted sutures. The patient is then dismissed with proper antibiotic, germicidal, and analgesic pharmacologic coverage.

Case Report

Case 1

The patient was a 23-year-old female in good general health with no known drug allergies. The lower anterior were missing from birth. Cone beam computed tomography (CBCT) scan evaluation of the partial edentulous area revealed a deficient buccolingual ridge. The regenerative procedure was accomplished as previously described and healing was uneventful. A second CBCT scan of the area was obtained 6 months later and revealed a significantly improved crystal morphology, which allowed for the ideal placement of three 3.3 mm diameter implant (myriad plus, equinox). Healing was uneventful and, after uncovering, the final restoration was delivered [Figures 1 (a-h) and 2 (a-c)].

Case 2

The patient was a 67-year-old male with high blood pressure pharmacologically controlled, and with no known drug allergies. He did not smoke, and he was referred to receive implants in positions 44, 45 and 46 regions. A CBCT scan revealed a severe buccolingual atrophy of the area. The regenerative procedure was then carried out according to the protocol mentioned above [Figure 3a-d]. No complications occurred following surgery. After 5 months, the patient was sent for a new CBCT scan that revealed an improved condition for implant placement. The regenerated area had three 4 mm diameter implants (Leader Italia). Uncovering was performed after 4½ months of uneventful submerged healing and the case was later restored [Figure 3 a-k].

Case 3

A 60-year-old male in good general health with no allergies came to our office for comprehensive dental treatment. He presented with old ill-fitting full dentures. In the maxilla, there was complete atrophy of the bone with bilateral pneumatization of sinuses. The patient was sent for CBCT scan and the ridge was found to be moderately deficient in the buccolingual dimension [Figure 4 a-k]. The GBR procedure was accomplished as mentioned above, without complications and healing was uneventful. After maturation of the graft, a second CBCT scan confirmed an improved situation for implant placement.

Discussion

The clinical report confirms the validity of a previously described surgical approach to horizontal GBR.^[1,2] For all of the presented patients, the regenerative technique improved

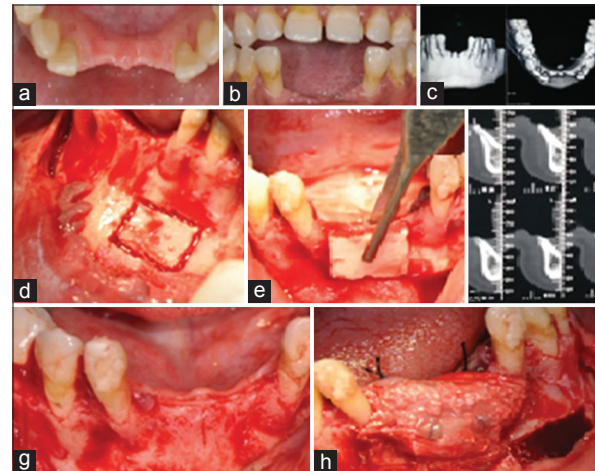


Figure 1: (a-h) Thin atrophic ridge of lower partial edentulous anterior mandible

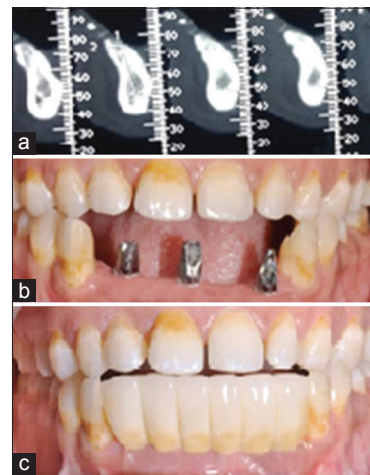


Figure 2: (a-c) Augmented ridge with implants and oral rehabilitation

the morphology of the partial and complete edentulous ridge, thus allowing for a more ideal implant placement. Better positioning of the fixtures allowed for final restorations with better emergence profiles, and as a result, the overall harmony of the implant-supported prosthesis in relation to the adjacent and opposing dental elements was enhanced. The adopted regenerative technique presents several advantages when compared with other surgical procedures designed to rebuild lost osseous structure,^[3,4] During GBR procedures, it is crucial to create a space that is properly isolated from the surrounding soft tissues and can be maintained for an appropriate period of time to ensure osteogenesis.^[5,6] In addition, speedy and adequate blood supply to the area are necessary to ensure rapid blood clot formation^[7] and the accumulation of a reservoir of endogenous bone-formative elements. The necessary space is created and preserved with the aid of a specialized biologic barrier membrane interposed between the graft site and the surrounding soft tissues. In GBR studies, resorbable membranes have been shown

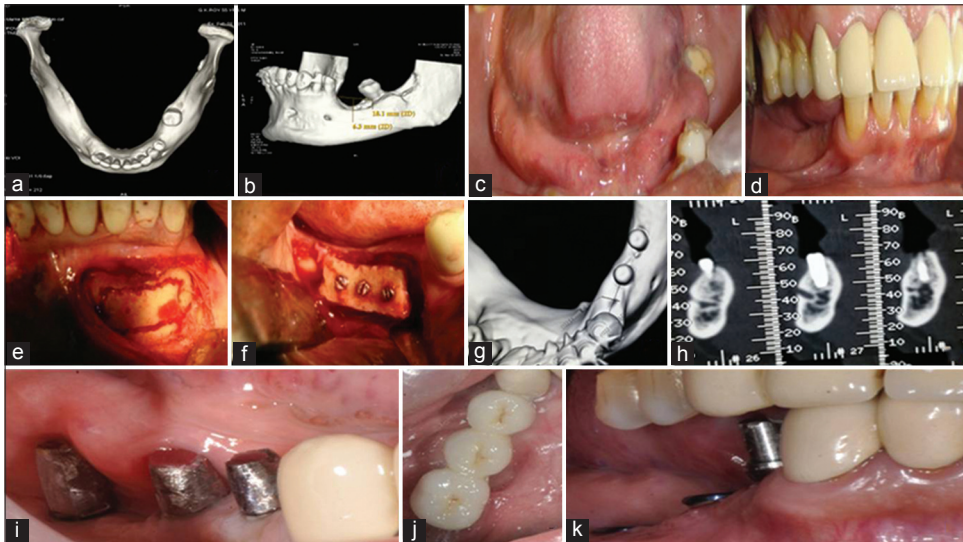


Figure 3: (a-k) Atrophic posterior mandibular ridges augmentation done with oral rehabilitation

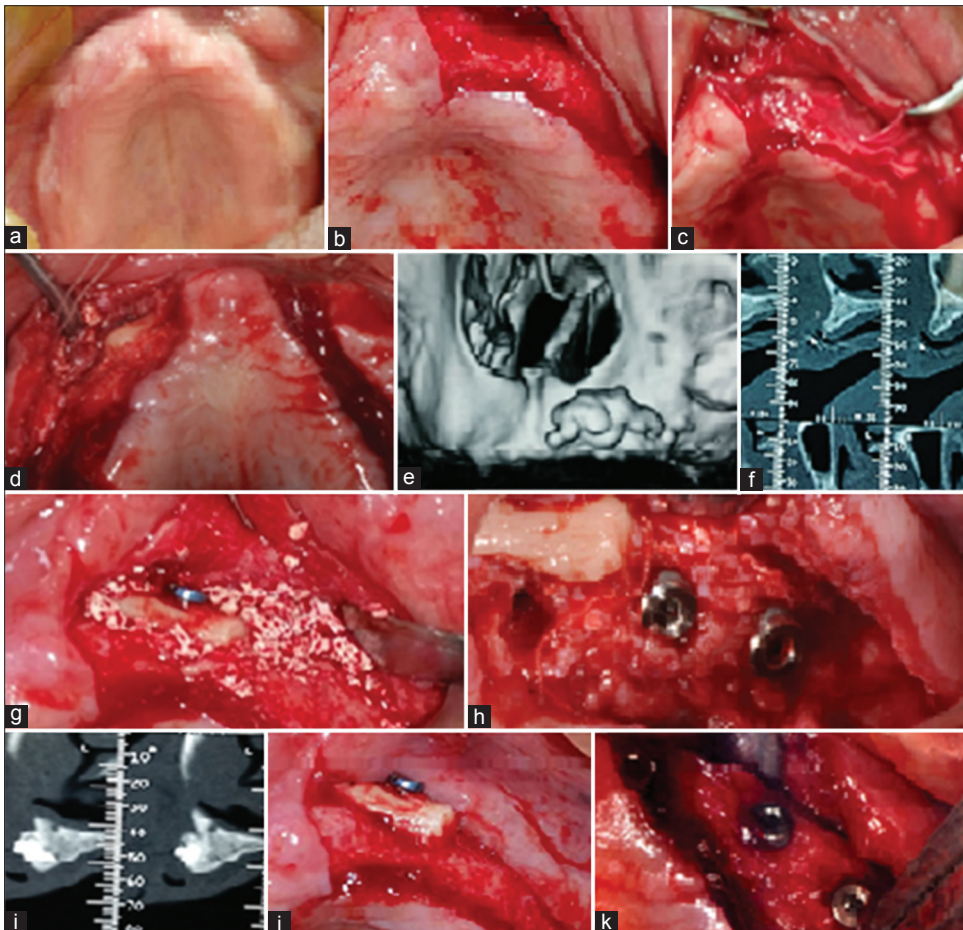


Figure 4: (a-k) Atrophic maxillary edentulous ridge, autogenous bone, bovine bone and collagen membrane used for augmentation, augmented ridge and implants

to be as effective as non-resorbable membranes.^[8,9] In addition, resorbable collagen membranes seem to be able to overcome

exposure problems and possible infection by promoting rapid soft tissue healing once exposed to the oral cavity, as opposed

to expanded polytetrafluoroethylene or non-collagenous resorbable membranes.^[10] In addition to space maintenance, the membrane plays a role in clot stabilization while simultaneously preventing migration of non-osteogenic tissues into the area. The created space can then be occupied by proliferating vascular, osteogenic cellular, cytokinal, and hormonal components with fundamental successful GBR.^[11] When the space created for GBR cannot be maintained because the membrane collapses into it, screw devices or graft/filler materials must be introduced into the space to prop up the membrane.^[12,13] It has also been shown that autogenous bone used as a filler will enhance osteogenesis by inductive and conductive processes. Furthermore, placement of a collagen barrier membrane over the graft sites might exclude unwanted cells from the wound, protect the wound, and, therefore, promote bone regeneration. From the histologic and immunohistochemical standpoints, no difference was found between the sites treated with or without membrane when block graft was used as the graft materials.^[1,14] However, recent studies have shown using a membrane during block graft procedures actually minimizes bone resorption.^[1,14] Our study did not aim to show the efficacy of placing a barrier membrane and its influence in bone resorption. However, we noted that the additional use of autogenous bone and absorbable membrane had successful outcomes for proper implant placement compared with the results in previous studies where these biomaterials were not used.^[15,16]

Conclusion

Within the limitations of the present study, a combination of block graft obtained from the ramus or symphysis, particulate xenograft, and then an absorbable collagen membrane as a cover is a predictable technique in augmenting atrophic ridge deficiency.

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